Periscope.

a.—ANATOMY OF THE NERVOUS SYSTEM.

THE CORPUS CALLOSUM.—Prof. D. J. Hamilton, of Aberdeen, has been investigating the course of fibres in the corpus callosum, both in the fœtal and in the adult brain. He finds that this body is not an inter-hemispherical commissure, as is generally supposed, but in reality the decussation of a great part of those fibres derived from the cortex which do not decussate at some point farther down. Fibres from the entire cortex of one side pass over to the opposite side through the corpus callosum, and then turn down into the inner and outer capsules. The bulk of the fibres which enter the internal capsule, both in its anterior and posterior segments, is composed of such crossed callosal bundles, while the motor and other fibres, which come chiefly from the cortex of the same side, which do not pass over in the corpus callosum, and which decussate farther down, constitute but a small part of the entire inner capsule. The outer capsule is composed of two layers, of which the internal is also derived from the corpus callosum, and is made up of fibres which have come through it from the opposite side and turned downwards. The chief destination of these crossed callosal fibres is the optic thalamus, although a few are traced to the caudate nucleus, and to the gray masses of the pons.

This view of the course of the collosal fibres is founded upon a study not only of the brains of the ape, monkey, horse, sheep, dog, cat, and pig, but also of human brains, both fœtal and adult. In the human fœtus at the fourth month, the callosal fibres are medullated, while no others are ; and hence they can be distinctly traced, and may be seen passing, as described, into the inner and outer capsules. In adult brains the same appearance is found when they are prepared in accordance with Hamilton's method. (See *Brain*, July, 1883.) The callosum has not been carefully investigated in the fœtal brain, the statements of Flechsig regarding it being somewhat vague. No theories are advanced by him regarding the function of these crossed callosal fibres. (*Brain*, July, 1885. *Jour. of Anat. and Phys.*, July, 1885.)

It is evident that this view is contradictory to all the statements of former anatomists, that it is opposed to the theory that similar parts of the two hemispheres act synchronously and harmoniously by their union with one another through commissural fibres, and that it overthrows all existing theories regarding symmetrical action of the two halves of the body under a joint action of the two hemispheres of the brain. Brain physiology, which does not rest on anatomical and pathological facts, is always questionable, and if the statements of Prof. Hamilton are confirmed by other investigators, pursuing both his own and other methods, the opposing theories will have to yield. The results here summed up were presented in an incomplete form to the Royal Society two years ago, and it is rather remarkable that such an important discovery should not have awakened more criticism. It is to be hoped that they will arouse an interest in this part of brain anatomy, which may result in more definite information regarding the function, as well as the structure, of the corpus callosum, than we at present possess.

THE FORMATIO RETICULARIS—ITS GRAY NUCLEI AND FIBRE-SYSTEMS.—Bechterew has published (*Neurolog. Centralbl.*, Aug. 1, 1885) a valuable paper upon the formatio reticularis of the medulla and pons, the discoveries announced being based upon an examination of this part in a series of fœtal brains, studied in Flechsig's laboratory.

The formatio reticularis lies between the gray matter of the floor of the fourth ventricle and the longitudinal fibres of the pyramidal tract, making up the greater part of the dorsal half of medulla and pons. Flechsig divides this area into two parts—an inner and an outer. In the medulla the inner area is bounded internally by the raphé, and externally by the hypoglossal root; the outer area is bounded internally by the hypoglossal root, and externally by the vagus root. In the pons the abducens root separates the inner from the outer area.

Bechterew describes several nuclei lying in this formation. In the inner area of the medulla lies the *nucleus centralis* of Roller, at the level of the upper half of the olivary body. Its cells are large, polygonal and spheroidal, and occupy the dorsal half of the area. In the inner area of the pons, in its middle and lower (caudal) parts, lies the *nucleus reticularis tegmenti pontis.* Its cells are of medium size, polygonal, and are scattered through the entire area. Above this nucleus, in the upper third of the pons in the inner area, and near to the median line, lies the *nucleus centralis superior*, whose cells are of medium size, and lie in a fine granular basis-substance. In the outer area of the formatio reticularis, in the medulla, lies the *nucleus lateralis*, just external to the olivary body, and internal to the ascending root of the fifth. In the corresponding part of the pons, in its caudal half, is the superior olivary body. In the tegmentum of the crus lies a third nucleus hitherto undescribed. It is situated between the red nucleus and the inner border of the lemniscus. It contains small- and medium-sized cells.

The systems of fibres in the formatio reticularis are numerous. In the inner area, next to the gray matter of the floor of the ventricle, lies the posterior longitudinal fasciculus, which Bechterew traces into this part from the primary anterior column of the cord. Ventrad of this, he distinguishes a second system which occupies a small area between the first and the interolivary tract, and which he traces to the primary lateral column of the cord. This latter system passes through and probably terminates, to some extent, in the nucleus centralis of Roller, though some fibres pass beyond this nucleus. Laterally from these two, in the outer area of the formatio reticularis, near the floor of the ventricle, is a third system, which can be traced from the lateral columns of the cord upward to the nucleus reticularis tegmenti pontis. Ventrad of this is another system, extending from the posterior part of the lateral column of the cord to the upper olive. Lastly, the lateral bundles of the lateral column end in the nucleus lateralis of the medulla. Through the entire outer area of the formatio reticularis extends a long bundle, whose origin and termination are uncertain. In the medulla it lies between the floor of the ventricle and the lateral nucleus, and inside the fifth root. In the pons it lies between the facial nucleus and the ascending root of the fifth, and in the crus outside of and behind the red nucleus. This is named the lateral-dorsal system and is thought to pass from the peripheral lateral column of the cord into the internal capsule. It is the only system of fibres which is continuous from the cord to the capsule through the formatio reticularis, and Bechterew believes that it conveys sensory impulses.

The systems of fibres which join the nuclei of the formatio reticularis with parts of the mid and fore-brains, are also numerous. The nucleus reticularis tegmenti is connected with the cerebellum through the anterior portion of the middle peduncle. It is connected with the post. corp. quad. by a bundle of fibres which runs parallel with the lemniscus, and is only to be distinguished from it in fœtal brains. Another bundle, lying just behind the lemniscus, passes from the nucleus near to Meynert's bundle, and with it toward the thalamus. A portion of the lemniscus ends in this nucleus. No other bundles are known.

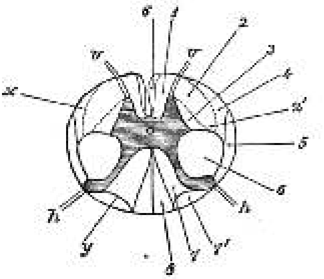
This communication of Bechterew is of interest, as it is the first attempt to distinguish between various longitudinal bundles of the formatio reticularis. Such an attempt can only be made by the method of Flechsig, and the fact that these observations were made under Flechsig's supervision lend them considerable importance.

THE LEMNISCUS.—This tract through the cerebral axis has recently attracted much interest on account of the researches of von Monakow and Spitzka. Flechsig and Bechterew have examined a number of fœtal brains, with the purpose of distinguishing its constituents. Flechsig finds that the lemniscus can be divided into three parts in the pons, a medium, a lateral, and a central, or chief part, lying between the first two, and larger than either. The lateral part is the first to become medullated. It extends from the post. corp. quad. downward to the upper olivary nucleus and corp. trapezoideum, thus forming a connection between the acoustic nerve and the corp. quad. This part does not pass down to the medulla or cord. The central part contains several bundles which develop at different times. First, a bundle which can be followed down from the pons through the interolivary tract and sensory decussation to the nucleus cuneatus of the column of Burdach. A portion of this seems to end above in the nucleus reticularis tegmenti pontis. A portion joins the lateral lemniscus, reaches the outer part of the tegmentum cruris, and ends in a hitherto undescribed ganglion lying at the junction of the ant. and post. corp. quad., which Flechsig names the nucleus lemnisci lateralis. A portion passes upward, and is lost in the formatio reticularis at the side of the red nucleus. Second, a bundle whose course below the pons resembles the first. Above the pons this bundle divides into two portions, one passing into the substantia nigra of the crus; the other passing upward into the internal capsule along the outer border of Luy's body, and thence into the lenticular nucleus, where it is lost in the first and second parts of the nucleus. Third, a bundle which passes downward with the first two, but ends in the nucleus gracilis of the column of Goll. Above the pons this can be followed through the tegmentum cruris and into the posterior part of the internal capsule, where some fibres turn toward the base of the thalamus, and others pass toward the corona radiata, and possibly go to the parietal cortex. Fourth, a bundle which passes from the pons to the nucleus centralis of Roller, and whose further connections are unknown. These bundles develop successively, and each can be distinguished in fœtuses of different sizes, from 30 to 40 cm. long. The median part of the lemniscus receives a medullary sheath some months after birth. It extends from the substantia nigra, and possibly from the mamillary body, down to the pons, but does not extend into the medulla.

From these statements it follows that the chief part of the lemniscus contains fibres which are the continuation upward of the posterior columns of the spinal cord. The fibres that come from the column of Burdach end in the gray nuclei of the medulla, pons, corp. quad., and lenticular nucleus. Those that come from the column of Goll end either in the optic thalamus, or pass through the internal capsule to the cortex of the parietal lobe.—*Neurolog. Centralbl.*, No. 15, p. 350.

THE COLUMNS OF THE SPINAL CORD.—Bechterew has studied the development of the columns of the cord in fœtuses of different ages, and finds that it is possible to distinguish by this method several divisions of the lateral column, and two parts of the column of Burdach. The diagram shows these divisions: 1. Primary ant. column; 2, primary lateral column; 2^1, its lateral portion which passes into the superior olivary nucleus; 3, lateral boundary column; 4, peripheral lateral column; 5, direct cerebellar column; 6, pyramidal lateral column; 6^1, pyramidal anterior column (Türck); 7, primary posterior column of early development; 7^1, primary posterior column of late development; $7 + 7^1 =$ col. of Burdach; 8, col. of Goll; *v. v.*, ant. nerve roots; *h. h.*, post. nerve roots. This scheme differs from that of Flechsig in distinguishing the columns separated by the lines x and y.

The peripheral lateral column (4) degenerates upward, as well as the direct cerebellar column, which fact explains the differences of opinion as to the exact anterior limit of the latter column. It also increases in size from below upward.



Cols. 1 and 2 pass into the inner portion of the formatio reticularis of the medulla, near the floor of the fourth ventricle. Cols. 2^1, 3, and 4 pass into the outer portion of the formatio reticularis of the medulla. Col. 5 passes to the cerebellum along the outer side of the formatio reticularis. Col. 6 crosses the median line in the lower decussation, and joins col. 6^1, and both together make up the anterior pyramid of the medulla. Cols. 7 and 7^1 end in the nucleus cuneatus. Col. 8 ends in the nucleus gracilis. From these two nuclei of the medulla new fibres arise which cross the median line in the upper decussation, and enter the interolivary tract of the medulla, there lying between the pyramid and the continuation of cols. 1 and 2.—*Neurolog. Centralbl.*, Aug. 1, 1885. M. ALLEN STARR, M.D., PH.D.

---

b.—PHYSIOLOGY OF THE NERVOUS SYSTEM.

THE SOUND ACCOMPANYING THE SINGLE CONTRACTION OF SKELETAL MUSCLE.—Drs. Herroun and Yeo have made a series